

REMARKS

Claims 16, 19-22, 25-28, 30, 31, 34-36, and 40-42 are pending. Claims 16, 22, 28, 30, and 31 have been amended and the remaining filed claims have been canceled. In addition, the specification has been amended to correct typographical errors.

Reconsideration of the application is respectfully requested for the following reasons.

I. Objection to the Drawings.

In the Final Office Action, claim 28 was objected to on grounds that the “optical waveguide comprises a plurality of light guiding cores” is not shown in any of the drawings. Applicants respectfully traverse this objection on grounds that the plurality of light guiding cores is shown, for example, in Figure 5. In this figure, multiple cores 22 are shown and the specification describes these cores, for example, at Paragraph [0052] of the specification.

As the Examiner will note, claim 28 has been amended to recite: “each core corresponding to a respective one of the pixel areas disposed in a column or row direction of the display device.” These features are supported, for example, at Paragraphs [0052] and [0053] of the specification.

II. The Rejection under 35 USC § 112, First Paragraph/New Matter Rejection.

The Examiner indicated that the following features recited in claim 16 and 31 introduced new matter into the application: “a refractive index of the liquid crystal holographic optical element and an angle of incidence of the input light do not satisfy a total internal reflection criterion.” The Examiner also issued a § 112, first paragraph, rejection on grounds that this recitation is not enabled by the specification and, further, that no written description of this recitation is found in the specification. The above-noted recitation has been deleted from claims 16 and 31, thereby rendering the § 112 and new matter rejections moot.

III. The Objections to the Claims.

In claims 16 and 31, the phrase “total internal reflection criterions” was found to be confusing and indefinite. This phrase has been deleted.

In claim 28, the phrase “plurality of light guiding cores” was found to be indefinite because it is unclear how these cores relate to the liquid crystal holographic element. Applicants respectfully submit that the foregoing comments regarding claim 28 and its support in the specification and drawings clarifies the meaning of these cores, along with the additional recitations added by amendment to claim 28.

In claim 31, the wherein clause was found to be indefinite. Claim 31 has been amended to recite that “an index of refraction of the liquid crystal holographic optical element is substantially the same as an index of refraction of a monomer included with the liquid crystal holographic

optical element when said voltage is applied by the pair of electrodes. (See, for example, Paragraphs [0077] - [0080] for support).

Applicants further note that claims 16 and 30 have been amended to clarify the arrangement of pixel areas in the display device. Specifically, these claims now recites that “each pixel area including a pair of electrodes formed from at least one electrode from the first set and at least one electrode from the second set, the pair of electrodes adapted to selectively apply a voltage across a corresponding pixel area of the liquid crystal holographic optical element.” (See, for example, Figure 3 and corresponding portions of the specification for support.)

IV. The Rejection under 35 USC § 102.

Claims 16 and 23-27 were rejected for being anticipated by the Izumi patent. This rejection is respectfully traversed for the following reasons.

Claim 16 recites that light is transmitted by a pixel when said voltage is applied by the pair of electrodes and wherein light is not transmitted by the pixel when said voltage is not applied by the pair of electrodes. In addition to these features, claim 16 recites that “the pair of electrodes applies said voltage a number of times over a predetermined period and frequency, said number of times equal to a gradation level of light to be transmitted by the corresponding pixel.” (See, for example, Paragraphs [0095] and [0096] of the specification and Figure 9 for support). These features are not disclosed by the Izumi patent.

The Izumi patent discloses two electrodes 23 formed on either side of a liquid crystal layer 24. (See Figure 1). In operation, when the electrodes apply an electric field to the liquid crystal layer, a corresponding pixel emits light. Conversely, when the electrodes do not apply an electric field, the pixel does not emit light. (See column 8, lines 34-68). A diffraction grating disposed between the guide and lower electrode is used to assist in taking light out of the medium. (See column 5, lines 23-26).

However, the Izumi patent does not disclose that its electrodes apply a “voltage a number of times over a predetermined period and frequency, said number of times equal to a gradation level of light to be transmitted by the corresponding pixel.” Absent a disclosure of these features, it is respectfully submitted that the Izumi patent cannot anticipate claim 16 or any of its dependent claims.

Dependent claim 28 recites that the optical waveguide comprises a plurality of light guiding cores, “each core corresponding to a respective one of the pixel areas disposed in a column or row direction of the display device.” These features are also not disclosed by the Izumi patent. Applicants therefore respectfully submit that claim 28 is allowable, not only by virtue of its dependency from claim 16 but also based on the features separately recited therein.

V. The Rejections under 35 USC § 103(a).

Claims 16 and 19-28 were rejected for being obvious in view of the Date patent. This rejection is respectfully traversed for the following reasons.

The Date patent discloses the formation of a liquid crystal layer between electrodes 201 and 203. As shown in Figure 21A, the electrodes are formed adjacent a light guide 204. When a voltage is applied by the electrodes, a holographic element in the liquid crystal layer emits light through a corresponding pixel. And, when no voltage is applied, the holographic element does not emit light. (See column 29, line 57 - column 30, line 5).

However, the Izumi patent does not disclose that its electrodes apply a “voltage a number of times over a predetermined period and frequency, said number of times equal to a gradation level of light to be transmitted by the corresponding pixel.” Absent a teaching or suggestion of these features, it is respectfully submitted that the Date patent cannot render claim 16 or any of its dependent obvious.

Claim 31 recites that an index of refraction of the liquid crystal holographic optical element is substantially the same as an index of refraction of a monomer included with the liquid crystal holographic optical element when said voltage is applied by the pair of electrodes. The Date patent does not disclose these features, i.e., Date discloses the inclusion of a polymer in a liquid crystal layer.

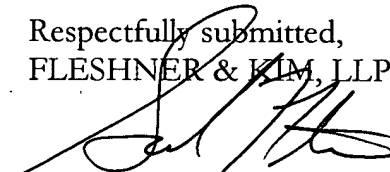
Date, however, does not teach or suggest including a monomer in a liquid crystal layer, and that an index of refraction of the liquid crystal holographic optical element is substantially the same as an index of refraction of a monomer when said voltage is applied by the pair of electrodes. Applicants respectfully submit that these differences further establish the allowability of claim 31 over the Date patent.

The Examiner issues a number of additional § 103(a) rejections based on various combinations of the Izumi, Date, and Rockwell patents. Applicants respectfully submit that the Rockwell patent does not teach or suggest the features added by amendment to claims 16 and 30. Accordingly, it is respectfully submitted that these claims and their dependent claims are allowable.

In view of the foregoing amendments and remarks, it is respectfully submitted that this application is in condition for allowance. Favorable consideration and timely allowance of the application are respectfully requested.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

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